Written Testimony[1]
of
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Before the United States House of Representatives
Committee on Energy and Commerce
Subcommittee on Energy and Air Quality

"Legislative Proposals to Reduce Greenhouse Gas Emissions: An Overview"

June 19, 2008

My name is Thomas R. Kuhn, and I am President of the Edison Electric Institute (EEI). EEI is the trade association of U.S. shareholder-owned electric companies and has international affiliate and industry associate members worldwide. Our U.S. members serve 95 percent of the ultimate customers in the shareholder-owned segment of the industry and represent about 70 percent of the U.S. electric power industry.

I. Introduction

The electric utility industry is committed to working with Congress to achieve greenhouse gas (GHG) legislation that will result in significant emissions reductions across the economy between now and 2050. Under any scenario, these reductions will be expensive, but the wisest way to accomplish them in the power sector is through the development and deployment of a full portfolio of climate technologies and measures over the long term. These include: energy efficiency for both supply and demand; renewable energy; advanced coal technologies integrated with carbon capture and storage; new nuclear power plants; and plug-in hybrid electric vehicles.

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[1] This testimony represents the views of the Edison Electric Institute (EEI). EEI has a diverse membership with a wide range of views, and this testimony does not reflect all of our companies' various views.

Likewise, the need for explicit cost-containment measures, such as a safety valve or price collar, within the context of an economy-wide cap-and-trade program to reduce GHG emissions in the U.S. would be important, especially during the initial years of the program, during which zero- and low-emitting advanced climate technologies are developed, become commercially available and are deployed, and as financial tools and strategies for managing price volatility and risk become widely available and are accepted.

GHG emissions reductions in the power sector must be made against the backdrop of population and economic growth: The Energy Information Administration (EIA) projects net electric demand to increase 30 percent by 2030, even after taking into account energy-efficiency improvements due to market-driven efficiency and stricter building codes and appliance and other efficiency standards mandated by the Energy Independence and Security Act of 2007 (EISA). The technological transformation of America's power sector will occur in the face of tremendous capital investment needs in order to meet the electricity needs of a growing population and economy. Even with substantial energy-efficiency measures, new and replacement power plant capacity is projected to total 150,000 megawatts (MW) and cost $560 billion by 2030.[2] Transmission and distribution investment needs are projected to total $900 billion by 2030.[3]

The most efficient way to reduce GHGs is through an economy-wide approach, with no exceptions. If there were exemptions and the power sector were the only covered sector or one of a few covered sectors, the odds of achieving environmental success would decline and the costs of regulation would be even higher. Electric generation is responsible for 34 percent of GHGs in the U.S., but transportation is responsible for 28 percent, industry for 19

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[2] The Brattle Group, "Transforming America's Power Industry: The Investment Challenge" 4, Edison Foundation Conference (preliminary results) (Apr. 21, 2008) (hereinafter referred to as "Brattle Group Presentation").

[3] *Id.* at 5.

percent, agriculture for 8 percent, commercial for 6 percent, and residential for 5 percent.[4] The least economically intrusive and most environmentally effective and equitable regulatory system will be comprehensive: It will involve the participation of all major emitting nations, all sources and sinks, all GHGs and all sectors of the economy. "[A] domestic regulatory system, like an international system, should move as rapidly as feasible towards including all sources and sinks under a cap."[5]

Furthermore, several studies show that GHG emissions reductions are available from other sectors of the economy—buildings, transportation, forestry and agriculture/waste—at lower costs than from the power sector.

We offer the following comments on pathways to achieve GHG reductions in comparison to the bills under consideration by the Subcommittee. **Our comments reflect the Global Climate Change Principles agreed upon by EEI's CEOs in February 2007, which focus on market-based mechanisms and provide the benchmark against which our industry evaluates federal legislation or action.** These Principles are attached in Appendix A.

II. The Technology Pathway For Long-Term Targets For The Power Sector

A. Summary

For the electric utility industry, the optimal path to achieve long-term targets will rely on development and deployment of a full suite of climate technologies and measures to assist in the transition to a low-carbon future. These include: improved end-use energy efficiency, increasingly efficient generation of power; renewables; advanced coal technologies (ACT)

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[4] Environmental Protection Agency (EPA), Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2005 at 2-22 - 2-23 (Apr. 15, 2007).
[5] M. Wara & D. Victor, "A Realistic Policy on International Carbon Offsets" 15, Stanford University Program on Energy and Sustainable Development, Working Paper #74 (Apr. 2008) (hereinafter referred to as "Stanford University Paper").

integrated with carbon capture and storage (CCS); new nuclear power plants; and plug-in hybrid electric vehicles (PHEVs).

In the near term, the power sector will engage in stepped-up energy-efficiency practices and enhanced renewable energy activities to help meet targets.[6] In the longer term, even with very aggressive assumptions about the potential for renewable energy and energy-efficiency deployment, the electric utility industry will need to depend on fossil fuel and nuclear generation to serve baseload demand. Short-term targets beyond what can be accomplished with efficiency and renewables that kick in before advanced technologies such as ACT with CCS and new nuclear plants are commercially available and deployed on a widespread basis would result in fuel switching from coal to natural gas, with negative impacts on gas supply and prices. In addition, this devotion of resources necessary to comply with short-term targets would frustrate our long-term national goals by diverting resources away from developing and deploying the technologies needed to meet long-term targets.

Thus, a two-pronged approach is needed for the electric utility industry. A primary focus should be on developing and commercially deploying climate technologies and practices, while relying on enhanced energy efficiency and increased renewables to the maximum extent feasible in the near term. In the near term, the goal would be to slow and eventually to stabilize the growth of GHG emissions. With new nuclear power plants being completed and ACT with CCS starting to become commercially available after 2020, more ambitious reduction targets could be achievable starting in the 2025 time frame. Even more aggressive reductions could be undertaken beginning in 2030 and beyond, on to 2050, assuming the U.S. is engaging in aggressive and widespread commercial deployment of the full suite of climate technologies. This would result in a nearly de-carbonized electricity supply. **Underlying this assumption are**

[6] The extent to which individual utilities will be able to reduce GHGs as a result of these practices and activities will be affected by load growth, regional variability and regulatory structure.

greatly increased funding of technologies by both the government and private sector, including financial and tax incentives, and removal of regulatory, economic and siting barriers. For example, if issues relating to loan guarantees for nuclear power plants are not resolved, or if ACT and CCS are not funded soon and do not develop in an integrated and cost-effective manner, generation choices would become greatly constricted, and some might be infeasible. If targets and timetables are not aligned with the nearer-term capabilities of expanded energy-efficiency and enhanced renewables, and the longer-term, widespread commercial deployment of new nuclear plants and advanced coal and CCS technologies, the costs of compliance would become astronomical and consumers would be compelled to curtail their use of electricity dramatically, with resulting consequences to the economy and the standard of living.

As the so-called "PRISM" work by the Electric Power Research Institute (EPRI) demonstrates,[7] a full technology pathway for the power sector is a far wiser path to follow than a limited technology approach. See Figure 1 below.

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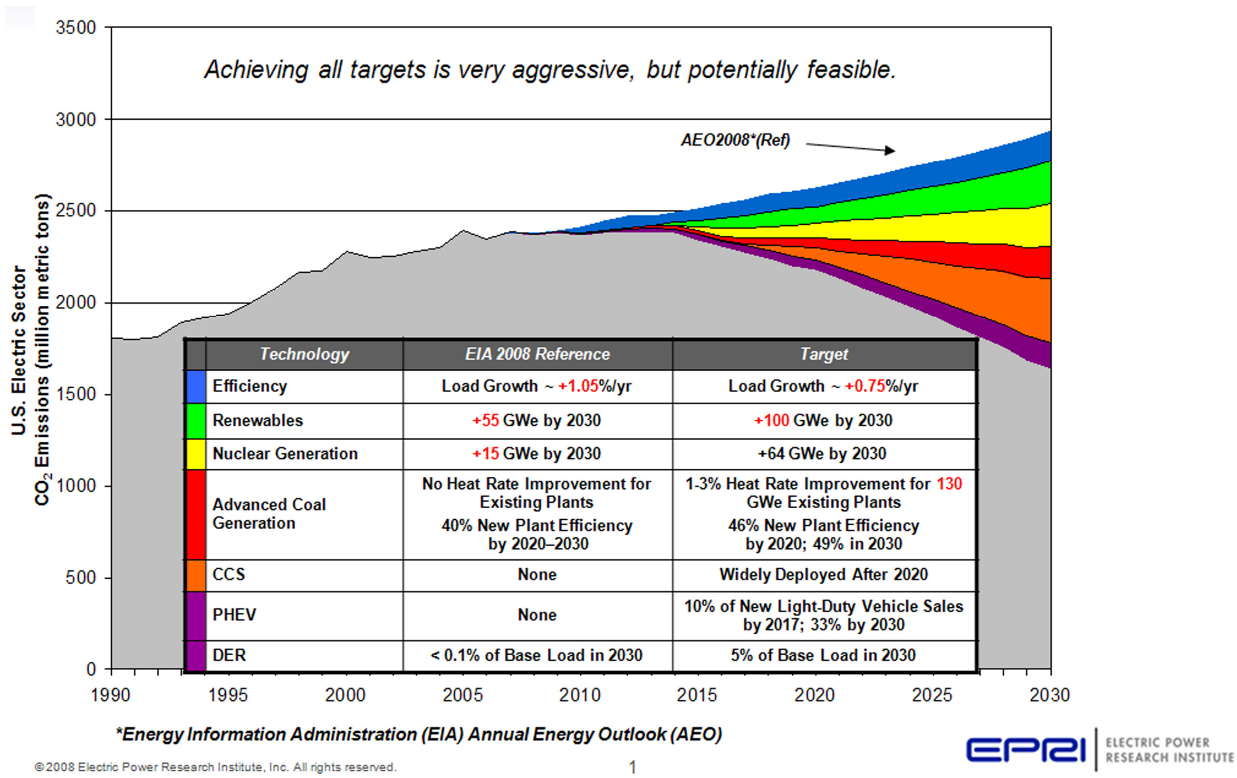
[7] EPRI, The Power to Reduce CO_2 Emissions – The Full Portfolio, Report 1015461 (Aug. 2007), available at: http://mydocs.epri.com/docs/public/DiscussionPaper2007.pdf. The PRISM in Figure 1 has been updated to reflect EIA's Annual Energy Outlook 2008, Report DOE/EIA-0383 (revised early release) (March 2008).

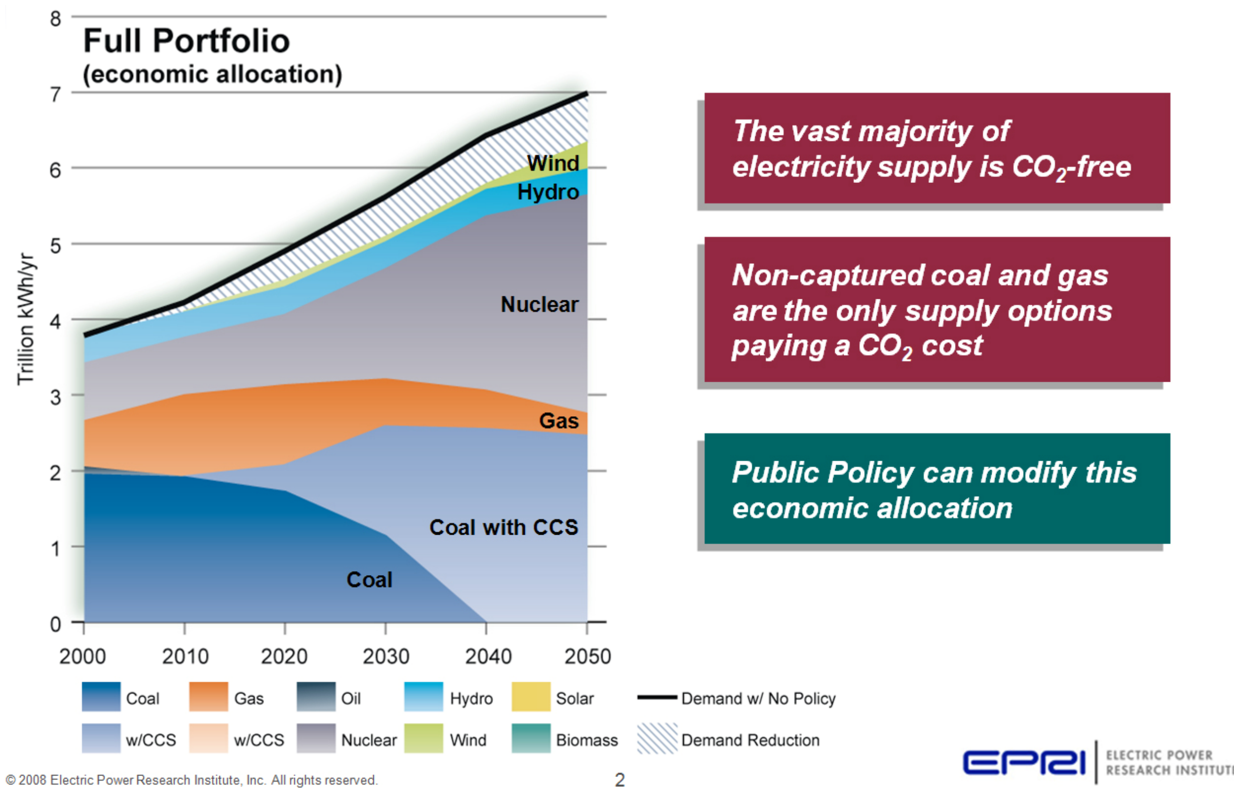
Figure 1: 2008 Prism...Technical Potential for CO_2 Reductions



Relating to Figure 1, note that the U.S.'s current capacity of renewable energy is 39 gigawatts (GW) and of nuclear energy is 118 GW.

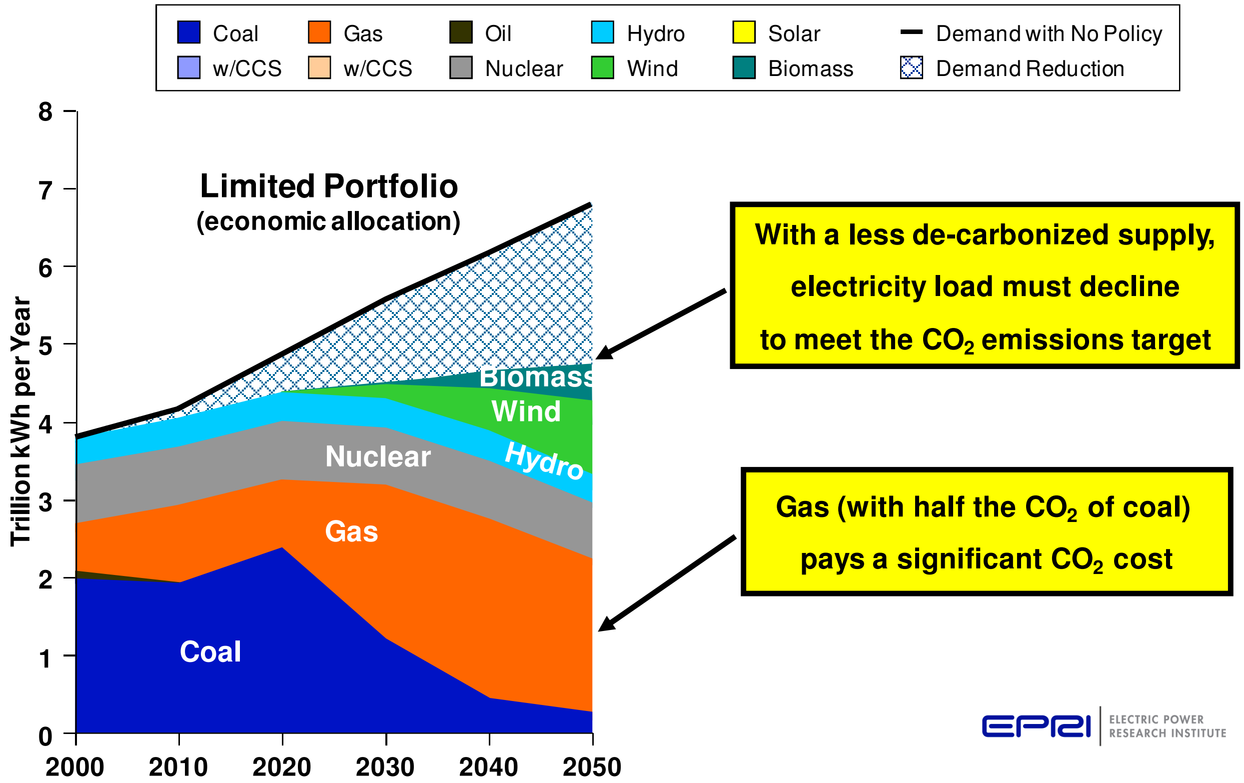
Each of the wedges in the PRISM represents very aggressive implementation of technical potential for a particular technology or measure—end-use efficiency, renewables, nuclear, ACT, CCS, PHEVs and distributed energy resources—and therefore assumes efficient resolution of economic, financial, regulatory and siting constraints. In this sense, the PRISM should be viewed as a roadmap or goal for the development of an optimal mix of supply- and demand-side resources. The **full portfolio** approach depicted in Figure 2 below—which meets the comparable level of emissions reductions as in the PRISM using an economic model—relies heavily on a renaissance of nuclear energy after 2020 and large deployment of ACT with CCS after 2020-2025. Under this economic allocation, the vast majority of electricity supply by 2050 is carbon free. However, changes in public attitudes and policies could modify this economic allocation.

Figure 2: U.S. Electric Generation – Full Portfolio



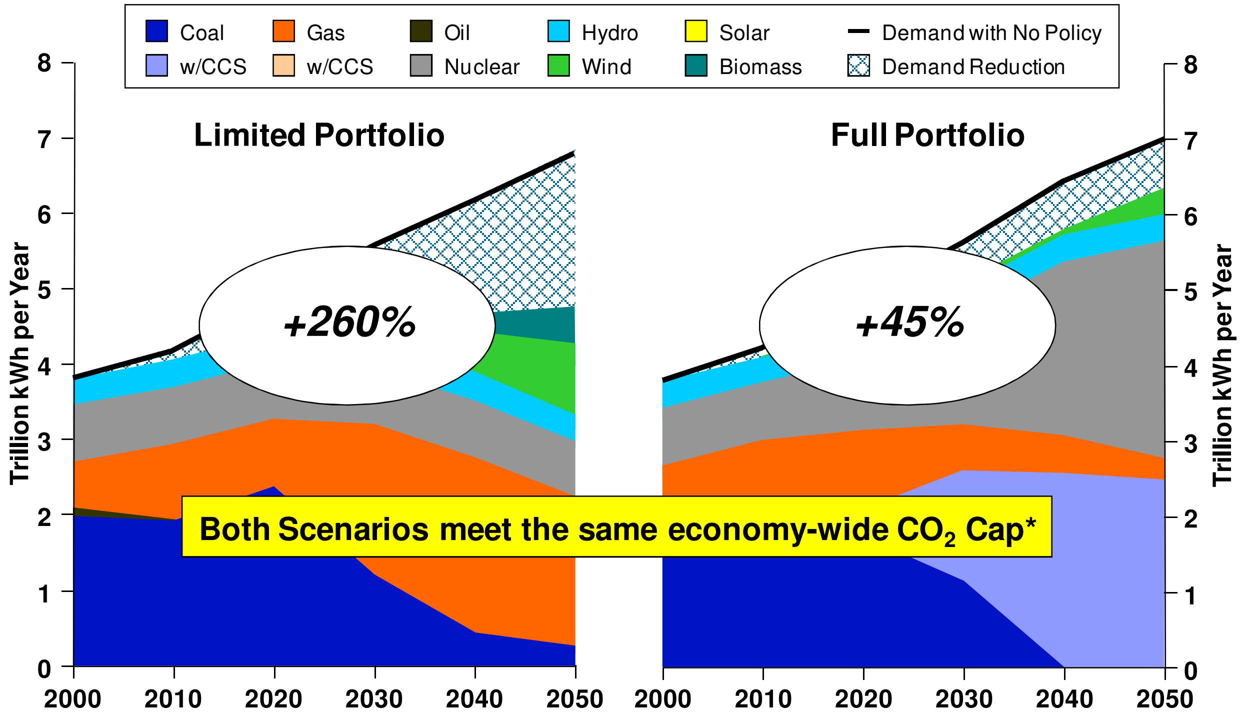
On the other hand, the **limited portfolio** approach depicted in Figure 3 below does not reflect either new nuclear energy or CCS by 2050. Consequently, electricity demand must decline in order to meet the GHG emissions target, and natural gas—which has a little more than half the carbon dioxide (CO_2) content of coal—carries a significant carbon cost.

Figure 3: U.S. Electric Generation – Limited Portfolio



As illustrated in Figure 4 below, both the full portfolio and limited portfolio approaches meet the same economy-wide carbon cap, yet the difference in increase in real electricity prices—45 percent compared to 260 percent—is vast.

Figure 4: Increase in Real Electricity Prices…2000 to 2050



*Economy-wide CO_2 emissions capped at 2010 levels until 2020 and then reduced at 3%/yr

The lessons of the EPRI analysis are threefold:

1) Under any scenario, the costs of compliance with GHG mandates will be high.

2) The wiser path to compliance for the power sector relies on development and deployment of a full portfolio of climate technologies and measures over the longer term.

3) Short-term targets should not lead the power sector off the long-term technology path.

An expanded discussion of the technology pathway is detailed in Appendix B.

B. <u>Severe Economic Dislocations Must Be Avoided, and Cost-Containment Mechanisms Could Help.</u>

In addition to alignment of targets and timetables with the commercial deployment of advanced climate technologies, the provisions in the bills under consideration by the Subcommittee that need the most change are cost-containment mechanisms. Such mechanisms generally fall into three categories: economic safeguard—safety valve or allowance price collar; offsets; and allowances. A fuller discussion of economic safeguards and offsets follows.

1. <u>Comparison of economic safeguards</u>

A reasonably priced safety valve, or allowance price ceiling, would prevent the severe economic disruptions that would otherwise occur under most of the bills under consideration by the Subcommittee, particularly in the near term (2010-2030). Variations on a safety valve[8] could include a price collar (or band), or a price floor in addition to a price ceiling, within the context of managing the overall GHG budget. A safety valve also would provide price certainty and some protection to the economy from price spikes and would facilitate investment in advanced technologies. Furthermore, a safety valve would help to prevent price volatility and market manipulation, unfortunate hallmarks of the California energy crisis of 2000-2001, the European Union (E.U.) CO_2 price experience under Phase I of its emissions trading scheme (ETS),[9] and various natural gas markets.

A strong justification for a safety valve was articulated in a June 12, 2003, letter from R. Glenn Hubbard (Council of Economic Advisors (CEA) chairman under President Bush) and Joseph Stiglitz (CEA chairman under President Clinton) to Sens. McCain (R-AZ) and Lieberman (I-CT):

> Our support for the safety valve stems from the underlying science and economics surrounding the problem of global climate change, and is something that virtually all economists—even the two with as politically diverse views as ourselves—can agree.
> . . . .
> First, unexpected events can easily make the cost of a cap-and-trade program that includes carbon dioxide quite high, even with a modest cap.
> . . . .

8 This is called a "technology accelerator payment" in S. 1766.

9 The high volatility of Phase I of the ETS, where the price of a CO_2 allowance ranged from under \$1 to more than \$30, illustrates the case for a safety valve. In addition, given the strong correlation of CO_2 allowances to natural gas prices in the E.U. experience, the hard constraints of a tough emissions cap can be expected to have additive impacts on both natural gas and electricity prices in the U.S.

> Second and equally important, the benefits from reduced greenhouse gas emissions have little to do with emission levels in a particular year.
>
> . . . .
>
> Finally, few approaches can protect the economy from the unexpected outcome of higher energy demand and inadequate technology as effectively as a safety valve.[10]
>
> . . . .
>
> To summarize, the climate change problem is a marathon, not a sprint, and there is little environmental justification for heroic efforts to meet a short-term target.

Labor unions have been very supportive of the safety valve concept. In writing to the Senate about S. 2191 on June 2, 2008, the president of the International Brotherhood of Electrical Workers wrote, "I am also distressed about the lack of a meaningful 'safety valve' regarding the cost of CO2 allowances." See also AFL-CIO congressional testimony of November 13, 2007.

There is an economic safeguard in S. 1766. By way of contrast, there are no safety-valve mechanisms in either H.R. 1590 or H.R. 6186. And while there are types of cost-containment mechanisms in S. 2191 and S.A. 4825, they are not practical. They do not cap allowance prices, and they rely heavily on borrowing.

While the most direct and efficient means of containing the costs of an economy-wide cap-and-trade program is to impose an upper limit on the price of an emissions allowance, *i.e.*, establish a safety valve price, some policy-makers and other stakeholders are concerned that a simple safety valve may not adequately incentivize investment in zero- and low-emissions GHG climate technologies. An alternative approach is to establish an allowance price pathway, with a ceiling and floor price, that increases over time. This allowance price pathway should be incorporated into a broader system that manages the overall GHG budget associated with a national cap-and-trade program over a multi-year period. This concept, known as a price collar, can help to establish a predictable price pathway, limit allowance price volatility, and thus

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[10] The discussion in the letter (omitted here) discounts alternatives to a safety valve such as offsets, a "circuit breaker," and banking and borrowing.

manage the overall cost of the program to the economy, those facing a compliance obligation and, ultimately, energy consumers.

The price collar would function by creating a trigger price to address high allowance prices, which would provide access to an allowance reserve in order to help increase quantities of allowances in the near term, placing downward pressure on allowance prices. At the same time, an allowance floor price would be created, which would be used as a minimum price in the allowance reserve. This floor price would help ensure a minimum level of investment is made in needed zero- and low-emission climate technologies. The price "band" between the floor and ceiling price could be narrow in the early years to provide more predictability and limit volatility, with the gap and overall price levels increasing over time.

In sum, most EEI members support a reasonably priced safety valve or price collar, especially as a transition mechanism from 2010 to 2030 until advanced technologies such as new nuclear plants and ACT and CCS are developed and commercially deployed on a widespread basis.

2. The importance of offsets as a cost-containment mechanism

Everyone is aware that GHGs are well-mixed in the atmosphere, are carried long distances and are a global phenomenon – hence, we talk about global climate change and global warming. There are no local effects or "hotspots" caused by GHGs.

So if an electric utility in the U.S. reduces, avoids or sequesters GHGs outside of its service territory or outside of the country, that offset or off-system action is just as effective in addressing climate change as a reduction within its own system. After all, a ton of GHGs is a ton of GHGs, no matter where it is reduced, avoided or stored.

While an economic safeguard is far and away the best cost-containment mechanism,[11] offsets comprise a critical tool in holding down the compliance costs of a GHG regulatory

[11] See n. 10, *supra*; Stanford University Paper, *supra* n. 5, at 5, 8, 18, 24.

regime. There is an important "niche role for offsets both as a tool for cost control within cap-and-trade systems and as one of a portfolio of tools for engaging developing nations in the problem of climate change."[12] This is particularly true for electric utilities. For utilities, some of the lowest-cost opportunities for reducing, avoiding or sequestering GHGs may be located outside of service territories, out of state or overseas. "Where" flexibility—the ability to mitigate GHGs anywhere in the world due to the ubiquitous nature of GHGs, which are well mixed in the atmosphere globally—is critical for lowering the costs of compliance.

A number of studies have demonstrated that domestically there is significant potential to reduce, avoid or sequester GHG emissions through offsets in unregulated sectors. This may include methane capture and destruction from coal mines, landfills and livestock; agricultural offsets of methane and nitrous oxide emissions; and afforestation, reforestation and forestry management.[13] The domestic potential from these activities is quite large.

Similarly, there is broad scope for international offsets, particularly in avoiding tropical and other deforestation, which accounts for 20-25 percent of global GHG emissions. The technical, economic and environmental potential of harnessing these offsets as well as other large sources of emissions through technologies such as ACT with CCS and nuclear energy is undeniably huge.[14] U.S. policy could play a very important role by counting these offsets, not restricting them, and even providing developmental support.

In addition to geographic flexibility, it is important that offsets not be arbitrarily limited in nature (or project type), scope or quantity. "We. . .counsel against many of the popular 'solutions' to problems with offsets such as imposing caps on their use."[15] **Legitimate concerns**

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12 Stanford University Paper, *supra* n. 5, at 9.
13 See, *e.g.*, *id.* at 15.
14 See, *e.g.*, *id.* at 20, 22.
15 *Id.* at 5; see also *id.* at 20.

with offsets may be addressed by monitoring, measurement, appropriate third-party verification and regulatory oversight.

Accordingly, we recommend that the bills under consideration by the Subcommittee be modified in the following ways:

- **In the case of H.R. 1590, by allowing the full and robust use of both domestic and international offsets.**
- **In the case of some of the other bills, by lifting numerical limitations on the use of both domestic and international offsets.**
- **In the case of the other bills, by not unduly restricting the qualifying criteria for offsets, but instead making them subject to monitoring, measurement, appropriate third-party verification and regulatory oversight.**

An EPA study of S. 2191 offers a good example of the severe negative economic impact that limited offsets can have. "If international credits are not allowed and domestic offsets are still limited to 15%, then allowance prices increase by 34% compared to the bill as written." [16]

III. Funding Needs For Increased Climate Technology Research, Development And Demonstration

As explained in Appendix B, the combined government and private sector research, development and demonstration (RD&D) funding needs for ACT and CCS are $800 million to $1 billion annually for the next 25 years. For the power sector overall, total government and private sector funding needs for climate technology RD&D are estimated to be about $1.4 billion **above current levels** annually to 2030.[17] (That number would of course be much higher economy-wide.) Current spending on power sector climate technology RD&D is estimated at

[16] "EPA Analysis of the Lieberman-Warner Climate Security Act of 2008" 6 (March 14, 2008).

[17] EPRI, *supra* n. 7, at 3-14 – 3-15. EPRI estimates that such climate technology RD&D investment could lower the costs of emissions reductions by as much as $1 trillion in the long run. *Id.* at 5-1.

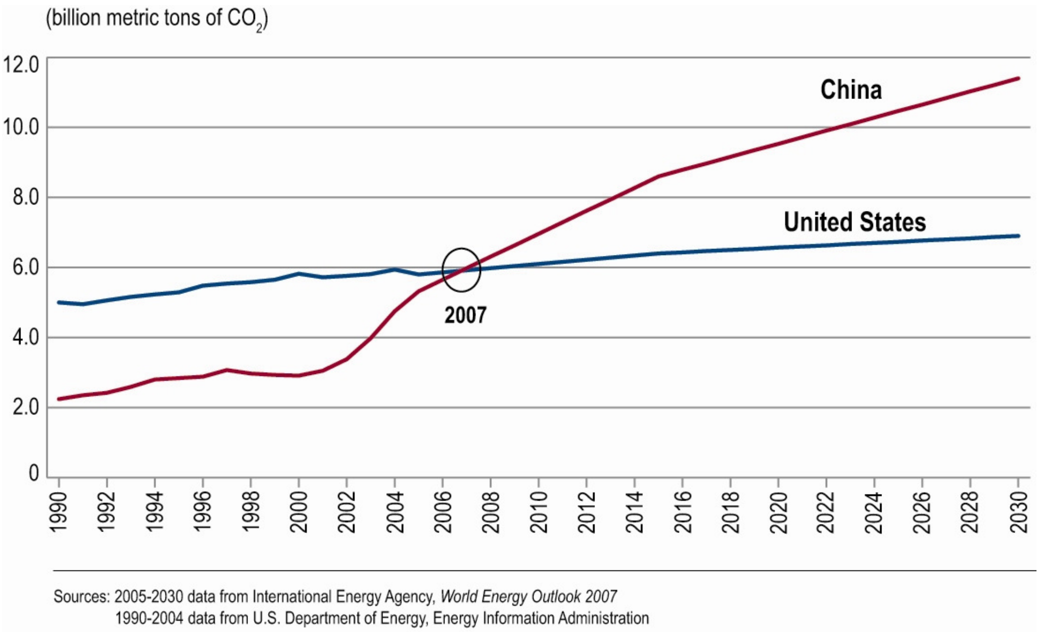
about $730-870 million for DOE in FY 2008.[18] For overall government spending on climate technology RD&D, the FY 2007 figure was about $2.1 billion. As acknowledged in Appendix B, the bills under consideration by the Subcommittee make progress in remedying those funding shortfalls, but clearly much more funding and support is needed in the near term from both the government and the private sector. This includes greater tax and financial incentives for zero- and low-emissions climate technology RD&D and deployment (including substantial loan guarantees for new nuclear energy and other technologies), as well as significant relief from onerous regulatory and siting barriers to new generation and transmission.

IV. International Competitiveness And Participation

Unless all major emitters of GHGs, including key developing countries, commit to reducing emissions, efforts by the U.S. to reduce its GHG emissions will be offset by rising overall global emissions from other countries. The International Energy Agency (IEA) predicts that global energy-related CO_2 emissions will increase 57 percent between 2005 and 2030, with developing countries accounting for more than 75 percent of this projected increase. In addition, as Figure 5 below illustrates, IEA data projected that China surpassed the U.S. in 2007 as the leading global emitter of CO_2 emissions.

[18] The breakdown is as follows: $240 million for solar, wind and geothermal technologies; $135 million for Nuclear Power 2010; $140 million for electricity delivery and reliability (which are arguably not climate-related); $235 million for ACT; and $120 million for CCS.

Figure 5: China Surpasses U.S. in Carbon Dioxide Emissions



The Netherlands Environmental Assessment Agency recently called the IEA projection "a robust conclusion."[19]

Furthermore, an EPA analysis of three Senate bills addressing CO_2 reductions concluded that each of the bills would have virtually no impact on global CO_2 concentrations if the U.S. were to act alone.[20] In the EPA analysis, global CO_2 concentrations would rise to 718 parts per million (ppm) in 2095, but the three bills studied would reduce global CO_2 concentration levels by only 23-25 ppm by 2095—or about 3.5 percent. The Lieberman-Warner bill could only have slightly more impact.

[19] "China Increases Lead as Biggest Carbon Dioxide Emitter," New York Times (June 13, 2008).
[20] EPA, "EPA Analysis of Bingaman-Specter Request on Global CO_2 Concentrations" (Oct. 1, 2007). The three bills analyzed were: S. 1766, Bingaman-Specter's Low Carbon Economy Act; S. 280, Lieberman-McCain's Climate Stewardship and Innovate Act; and S. 485, Kerry-Snowe's Global Warming Reduction Act.

Ensuring that developing countries take actions to reduce their GHG emissions is vital for helping U.S. industry remain competitive in the global marketplace, as acknowledged in a recent paper prepared by this Committee.[21]

Most of the bills under consideration by the Subcommittee do include provisions designed to address competitiveness concerns, requiring importers to submit allowances to cover the GHG emissions produced in making certain GHG-intensive products in countries that have not taken comparable action to the U.S. Imports from countries that have taken comparable action would not face this requirement. **It is important that the effective date of any such provision closely follow enactment of the enabling legislation.**

Additional policies to encourage developing countries to reduce their GHG emissions as part of an effective climate change policy could include:

- Providing for the full and robust use of offsets from overseas activities to encourage actions in developing countries.

- Utilizing the resources and expertise of the World Bank, Overseas Private Investment Corporation, Export-Import Bank, and other multilateral and regional development banks to help "buy down" the difference in cost between conventional and advanced technologies to help engage developing countries in GHG-reduction activities.

- Fully funding international agreements—such as the Asia-Pacific Partnership on Clean Development and Climate (APP)—that address climate change issues through research and technology transfer. The APP involves governments working with the private sector to expand investment and trade in cleaner energy technologies. Australia, Canada, China, India, Japan, Korea and the U.S. are participating countries.

Another idea recently proposed by the Carnegie Endowment for International Peace[22] would be for the U.S. and China to set individual, national goals and then work together to achieve them through domestically enforceable measures and international agreements to prevent

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[21] U.S. House of Representatives, Committee on Energy and Commerce, "Climate Change Legislation Design White Paper: Competitiveness Concerns/Engaging Developing Countries" (Jan. 2008).

[22] W. Chandler, *Breaking the Suicide Pact: U.S.-China Cooperation on Climate Change*, Carnegie Endowment for International Peace, Policy Brief 57 (March 2008).

either nation from taking advantage of steps taken by the other. Three priority areas for cooperation would be: development of best practices technologies, innovation in new technologies, and agreements to prevent the two countries from taking advantage. The proposal also calls for making climate cooperation integral to trade policy, such as jointly setting product standards to limit the energy used in manufacturing exports. If successful, the approach could be exported to other countries.

Finally, another recent proposal from Stanford University[23] recommends that the U.S. 1) in collaboration with other developed countries, invest in a "Climate Fund" to finance critical changes in developing country policies to lead to near-term reductions, and 2) actively pursue a series of infrastructure deals with key developing countries to shift their longer-term development trajectories consistent with large GHG emissions reductions as well as their own interests.

V. Avoiding Multiple Federal Regulation Of GHGs And Harmonizing Federal And State Climate Policies

Several important regulatory and policy issues are only briefly or indirectly addressed—if at all—in the bills under consideration by the Subcommittee. Among the most important of these are the need to avoid multiple regulation of GHGs by federal statutory authorities and the need to harmonize federal and state climate law and policies.

With respect to the first issue, numerous authorities from the White House to the Congress—including the chairman of this Committee—to academia have called for a single comprehensive federal climate law, rather than a regulatory regime consisting of multiple, overlapping or conflicting statutes. One of the worst outcomes would be comprehensive climate legislation that leaves intact piecemeal regulation of GHGs under the Clean Air Act (CAA),

[23] Stanford University Paper, *supra* n. 5, at 6, 18-19, 21-23.

Clean Water Act, Endangered Species Act (ESA), National Environmental Policy Act (NEPA) and other federal statutes. Backdoor regulation of GHGs is already being attempted in CAA permitting cases, a NEPA petition is pending at the Council on Environmental Quality, and the Department of the Interior's ESA polar bear listing has already spawned litigation. Avoidance of this "glorious mess" should be a paramount objective of the Congress.

With respect to the second issue, numerous authorities from the Congress—we note this Committee's white paper on "Appropriate Roles for Different Levels of Government"—to labor to industry have called for the harmonization of federal and state climate laws and policies. States may well have appropriate roles in land-use programs and urban transit, renewable portfolio standards, and energy-efficiency standards and building codes. However, assuming cap-and-trade is the approach that Congress embarks on, there should be only one national cap-and-trade program. The prospect of federal, regional and state cap-and-trade programs, with multiple costs imposed on consumers through various allowance allocation and auction schemes, is an undesirable one from a policy standpoint.

Attachments

Appendix A

EEI Global Climate Change Principles
2-8-07

BACKGROUND

EEI's member companies clearly recognize the growing concerns regarding the threat of climate change. Since 1994—when EEI joined the U.S. Department of Energy in the Climate Challenge—the electric utility industry has led all other industrial sectors in reducing greenhouse gas emissions. Through various programs now under way—including Power Partners℠, the Asia-Pacific Partnership and individual company efforts—that commitment continues.

Today, EEI's members recognize a growing imperative to make even deeper reductions in greenhouse gas emissions. No matter what the ultimate path is, success in that mission—while maintaining the reliable and reasonably priced electricity supply so vital to our economic well-being and national security—will require an aggressive and sustained commitment by the industry and policymakers to the development and deployment of a full suite of technology options, including:

- An intensified national commitment to energy efficiency, including advanced efficiency technologies and new regulatory and business models;
- Accelerated development and cost-effective deployment of demand-side management technologies and renewable energy resources;
- Advanced clean coal technologies (e.g. advanced pulverized coal, fluidized bed and IGCC technologies);
- Carbon capture and storage for all types of fossil-based generation;
- Increased nuclear capacity and advanced nuclear designs; and,
- Plug-in electric hybrid vehicles.

Although some of these options are currently available—albeit at a higher cost than conventional generation sources—many are not. All have different time horizons, but all are critical to our dual goals of addressing greenhouse gas emissions and maintaining a reliable, affordable electricity supply in a carbon-constrained world. Moreover, because of the global nature of the problem, solutions will require the participation of the entire world economy, including China and India.

PUBLIC POLICY PRINCIPLES

EEI will continue to emphasize the importance of:

- A reliable, stable and reasonably-priced electric supply to maintain the competitiveness of the U.S. economy;
- A fuel-diverse generation portfolio to assure system reliability, energy security and price stability;
- Public policies and initiatives to accelerate the development of viable and cost effective energy efficiency programs and technologies; zero- or low-emissions generation technologies; and carbon capture and storage technologies;
- International partnerships to address climate change as a global issue that requires global solutions, including appropriate participation by developing nations, such as China and India; and,
- Solutions compatible with a market economy that deliver timely and reasonably priced greenhouse gas reductions.

EEI supports federal action or legislation to reduce greenhouse gas emissions that:

- Involves all sectors of the economy, and all sources of GHG;
- Assures stable, long-term public/private funding to support the development and deployment of needed technology solutions;
- Assures compliance timelines consistent with the expected development and deployment timelines of needed technologies;
- Employs market mechanisms to secure cost-effective GHG reductions, and provides a reasonable transition and an effective economic safety valve;
- Establishes a long-term price signal for carbon that is moderate, does not harm the economic competitiveness of U.S. industry and stimulates future investments in zero- or low-carbon technologies and processes;
- Addresses regulatory or economic barriers to the use of carbon capture and storage and increased nuclear, wind or other zero- or low-GHG technologies;
- Minimizes economic disruptions or disproportionate impacts;
- Recognizes early actions/investments made to mitigate greenhouse gas emissions;
- Provides for the robust use of a broad range of domestic and international GHG offsets;
- Provides certainty and a consistent national policy; and,
- Recognizes the international dimensions of the challenge and facilitates technology transfer.

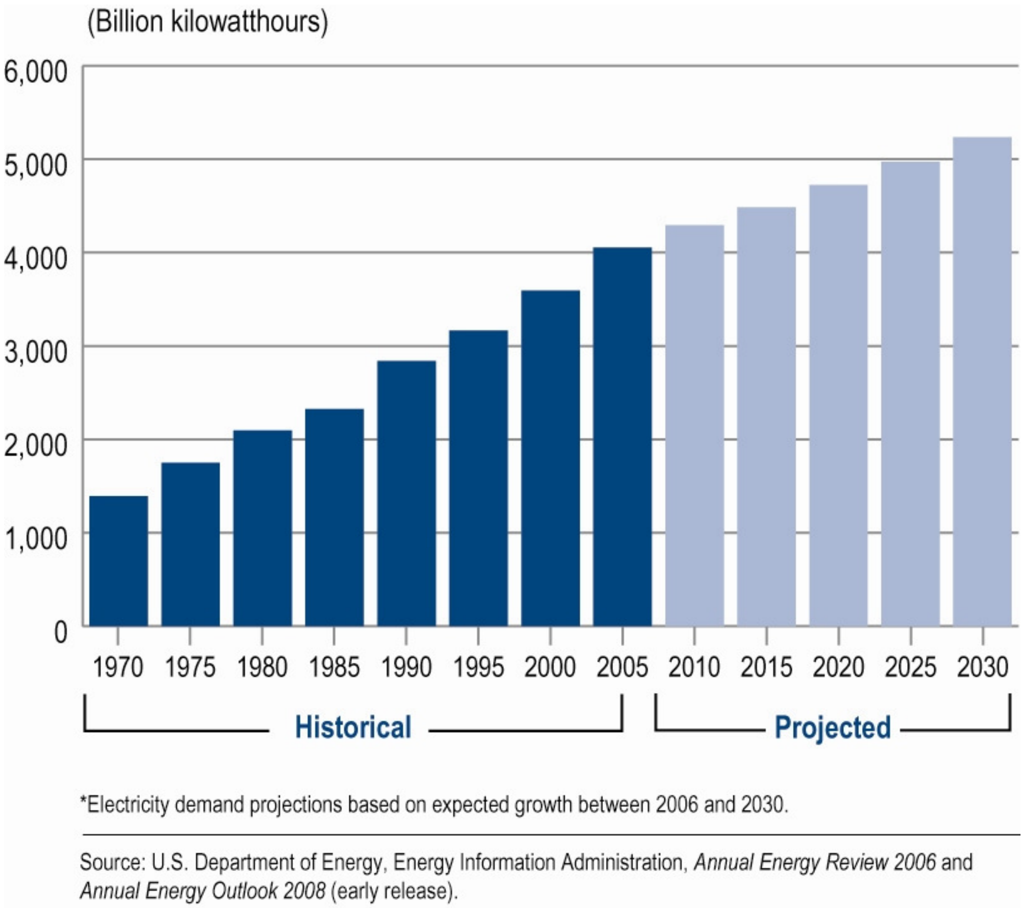
Expanded Discussion of the Full Technology Pathway

I. Electric Demand Is Projected To Grow 30 Percent By 2030.

EIA projects net electric demand to increase 30 percent by 2030, due primarily to economic and population growth.[24] See Figure 6 below. This projection already takes into account autonomous energy-efficiency improvements due to market-driven efficiency (5 percent) and stricter building codes and appliance and other efficiency standards (18 percent)[25] mandated by EISA.

[24] EIA, Annual Energy Outlook 2008 (early release).
[25] EPRI, "Energy Efficiency: How Much Can We Count On?," Edison Foundation Conference, Keeping the Lights On: Our National Challenge at 12 (Apr. 21, 2008) (hereinafter referred to as "EPRI Energy Efficiency Study").

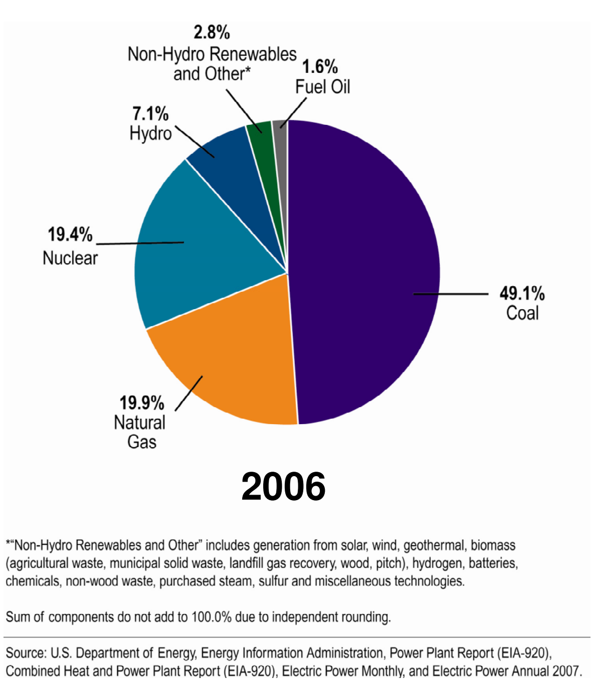
Figure 6: Demand for Electricity Is Projected to Increase at Least 30% by 2030

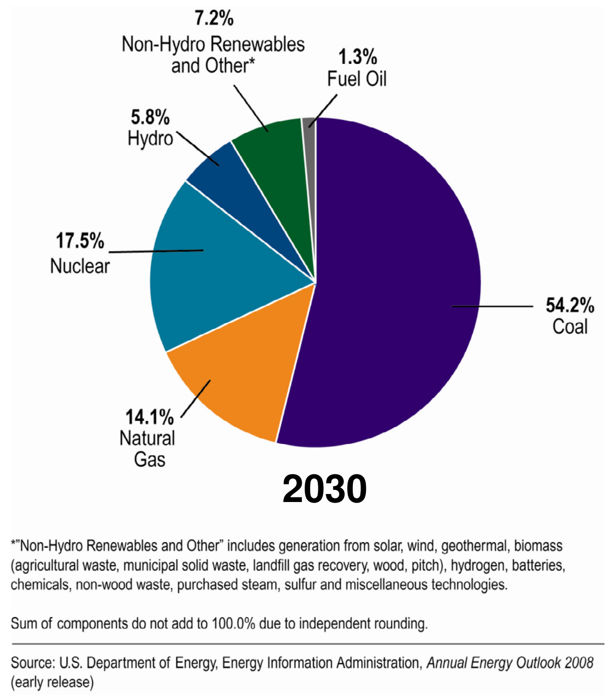


Before the power sector can tackle the kinds of short- and mid-term targets proposed in most of the bills under consideration by the Subcommittee,[26] one must consider the national backdrop against which such reductions would have to occur. Accordingly, Figure 7 below presents the national electric generation fuel mix in 2006 compared to EIA's 2030 projections. **Note that the generation resource "pie" in 2030 is projected to be 30 percent larger in 2030 than it was in 2006.**

[26] The targets and timetables in H.R. 1590 and H.R. 6186 are even more stringent than the Lieberman-Warner bill, which would require GHG emissions reductions of 7 percent below 2006 levels by 2012, 39 percent below 2006 levels by 2030 and 72 percent below 2006 by 2050. See EIA, "Energy Market and Economic Impacts of S. 2191, the Lieberman-Security Climate Security Act of 2007" v (Apr. 2008). The targets and timetables in S. 1766 are ameliorated by the technology accelerator payment until about 2020 and then are as tough as other bills by 2030.

Figure 7: Current National Fuel Mix Compared to EIA's 2030 Projections





Looking ahead, EIA's early release Annual Energy Outlook 2008 projects that coal-fired power plants will continue to supply most of the nation's electricity through 2030.[27] In 2006, coal-fired plants accounted for nearly half of generation and natural gas-fired plants for about 20 percent. In 2030, the generation shares for coal and natural gas are projected to be 54.2 percent and 14.1 percent, respectively.

Under its reference forecast, by 2030 EIA also projects nuclear and renewable capacity (including conventional hydroelectric) to increase as 17 GW of new nuclear plants and 47 GW of new renewables are built, stimulated by federal loan guarantees and tax incentives and rising fossil fuel prices. Although nuclear generation is expected to increase modestly, with

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[27] Ninety percent of U.S. coal is used for electric generation. In 2007, 5 percent of U.S. coal was exported. "An Export in Solid Supply," New York Times (March 19, 2008). That figure is expected to reach 7-8 percent in 2008. *Id.* Without the participation all major emitting nations in binding GHG commitments, such exports would increase with the imposition of stringent near-term targets and timetables, thus resulting in the movement of GHG emissions off-shore via leakage.

improvements in plant performance and expansion of existing facilities, EIA projects that the nuclear share of total generation will fall from 19.4 percent in 2006 to 17.5 percent in 2030. The generation increase in renewable capacity (including conventional hydroelectric) reflects an increase in non-hydro renewables from 2.8 percent of total generation to 7.2 percent.

EIA forecasts that relative fuel costs, particularly for natural gas and coal, will affect both the utilization of existing capacity and technology choices for new plants. Changes in energy and environmental policies could also affect the Annual Energy Outlook 2008 projections for capacity additions.

II. Enhanced Energy-Efficiency[28] Efforts Can Help To Reduce Electric Demand Growth In the Near Term.

Energy efficiency is a critical tool for addressing GHG emissions because it represents one of the major activities that can be undertaken immediately to reduce the need for electricity. It can be a low-cost option. Examples of energy-efficient technologies include: geothermal heat pumps, heat pump water heaters, variable-speed drive motors, and compact fluorescent and light-emitting diode (LED) lighting. In addition, energy efficiency affects CO_2 emissions not only through direct load reduction but also through deferring the need for new generation, buying time for cleaner and more efficient generation to come on-line.[29] As fuel and construction costs increase for new baseload generation, higher electricity prices will play an increasing role in capturing and motivating efficiency improvements. However, the challenge for increasing the role of energy efficiency is not solely a technological one, but also one that requires addressing market, behavioral and regulatory barriers.

[28] This section addresses demand-side energy efficiency, or customer-focused and end-use energy efficiency. Supply-side energy efficiency is addressed in section IV below.
[29] EPRI, *supra* n. 7.

Achieving energy efficiency involves many consumers taking action rather than just industry. It will require policy-makers to address market imperfections by aligning incentives for companies and customers. For electric utility companies and state and federal regulatory commissions, it means changing business models from a supply orientation to considering both supply and demand. It also means that serious consideration must be given to demand response options, real-time pricing, development of the "smart grid," and regulatory mechanisms that encourage and reward the pursuit of customer-based energy efficiency (*e.g.*, decoupling and rate incentive mechanisms). This is because regulatory policies often blunt price signals and do not reward investment in demand-based activities.[30]

There is also a diverse range of opinion regarding what role energy efficiency will play going forward. Note that the average annual growth rate in electricity over the last decade was 1.8 percent annually, even with substantial energy-efficiency improvements. In its revised PRISM analysis,[31] EPRI assumes a 0.75 percent average annual growth rate in electric demand, while others claim that the country's electricity needs over the next 20 years can be met solely through increased efficiency and renewable energy. Regarding the latter claim, **EPRI's revised PRISM indicates the reduction in consumption through energy efficiency (beyond the considerable autonomous energy-efficiency improvements cited earlier) is 7-l1 percent by**

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[30] A primary concern of electric utilities is that traditional regulatory frameworks do not compensate efficiency efforts in a manner that effectively treats those investments the same way as investments in generation, transmission and distribution. Various business models are being implemented or proposed that: 1) allow timely cost recovery, 2) compensate for lost sales and 3) provide shareholder incentives for pursuing efficiency.

[31] EPRI, "Electricity Technologies in a Carbon-Constrained World," Air and Waste Management Association (Apr. 3, 2008).

2030[32]—significant, but even in combination with renewables far short of the 30 percent increase in net electric demand projected by EIA (see section I above and p. 29 *infra*).[33]

A key for all business models is sustainability—the revenue mechanism and value proposition must be durable over time. Customers need incentives to make energy efficiency a long-term goal, regulators need to see cost savings and customer benefits to ensure that the public interest is being protected, and utilities need regulators' support to ensure the certainty of their investments and planning. Short-term fluctuations in customer needs, technological innovation, regulatory factors and competitor actions must not undermine the model.[34] Some of these issues were addressed in the EISA, which requires states to consider ways to align utility incentives with energy efficiency. However, if this alignment of utility incentives with energy efficiency either does not occur or takes longer than expected, it will not be possible to realize the total potential benefits. Thus, regulatory reform and the creation of business models—while primarily a state-based activity—should be considered in conjunction with any federal plan for addressing GHGs.

Technology will also have to be developed and deployed to ensure that the existing grid infrastructure continues to work reliably and safely, while facilitating a transition to an intelligent or smart grid. Smart grid is a broad term for an ever-widening portfolio of utility applications that enhance and automate the monitoring and control of electric distribution networks for added reliability, efficiency and cost-effective operations.[35] The smart grid provides utilities the ability

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[32] EPRI Energy Efficiency Study, *supra* n. 25, at 14. **Thus, cutting demand growth by a quarter via energy efficiency by 2030 would still leave the electricity growth rate at 22.5 percent.** *Id.*

[33] Some EEI member companies may be able to achieve greater energy-efficiency improvements than posited by the EPRI PRISM. Other member companies may have difficulty achieving such efficiency gains due to load growth, regional differences or regulatory structure.

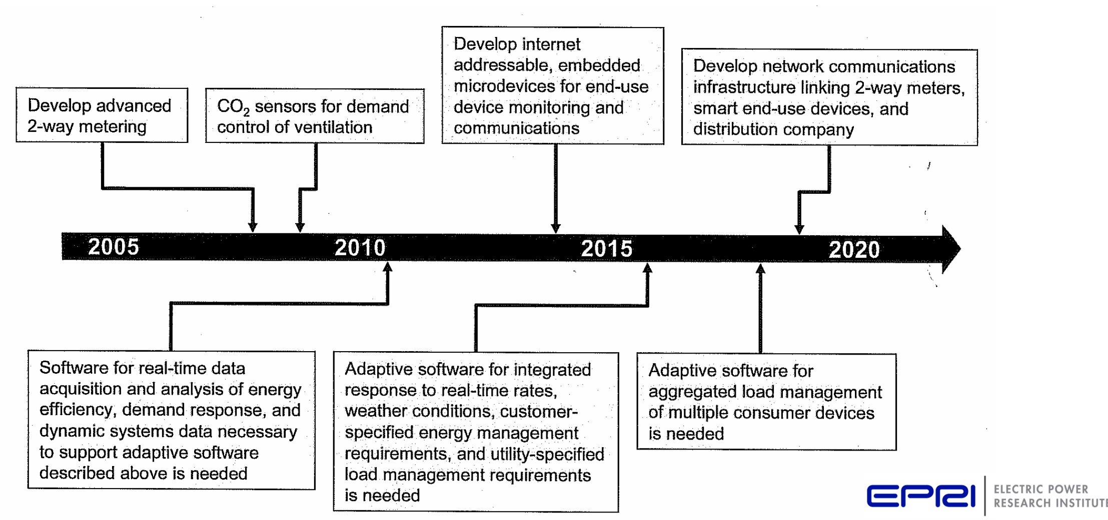
[34] NERA Economic Consulting, "Making a Business of Energy Efficiency: Sustainable Business Models for Utilities," Washington, D.C. (2007).

[35] Functionally, a smart grid should: enhance active participation (or two-way communications) by customers; accommodate all generation and storage options; enable new products, services

to make energy efficiency more automatic for customers, perhaps as a "default" service. This should make a huge difference for market penetration of demand-side management and end-use energy-efficiency technologies and practices.

The costs of building a major portion of the smart grid, advanced meter infrastructure, have been estimated at \$19-27 billion.[36] **Tax incentives for a smart grid would be very helpful, such as 5-year depreciation for smart meters and 15-year depreciation for distribution assets.** In addition to major funding, full development and deployment of the smart grid will take time. Figure 8 below illustrates the timeline for development and deployment of the smart grid. In parallel, implementing demand response will facilitate the transition to a smart grid. Nonetheless, many valuable energy-efficiency programs can be launched today without it.

Figure 8: Timeline – Efficiency and Demand Response



Energy-efficiency abatement opportunities are widely spread across the economy, with power generation only accounting for approximately one-third of the total potential. Many GHG

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and markets; provide power quality for the digital economy; optimize asset utilization and operational efficiency; anticipate and respond to system disturbances; and operate resiliently under attack and natural disasters.

[36] Brattle Group Presentation, *supra* n. 2, at 22.

emissions reductions are available from other sectors of the economy—buildings, transportation, forestry and agriculture/waste—at lower costs than from the power sector.

III. <u>Robust Investment In Renewable Energy Can Help To Meet Some Of Our Electricity Needs In The Near Term.</u>

Increasing the deployment of renewable energy is another critical tool for addressing GHG emissions. However, while the share of renewable energy in the nation's electricity mix has increased—wind power has become the second largest source of new power capacity in the U.S. behind natural gas—many economic, regulatory and regional challenges remain that will affect the growth of renewable sources of energy.

There is also a diverse range of opinion regarding what role renewable energy will play going forward. In its revised PRISM analysis, EPRI assumes an additional 100 GW of renewables will be built by 2030—which would be two and a half times the current renewables capacity— while others, as noted earlier, claim that the country's energy needs over the next 20 years can be met solely through increased efficiency and renewable energy. Again, regarding the latter claim, **EPRI's revised PRISM assumption for renewables is 9.1 percent of total EIA projected electric generation capacity by 2030[37]—significant, but even in combination with energy efficiency far short of the 30 percent increase in net electric demand projected by EIA** (see section I above and p. 27 *supra*).

With the exception of wind energy in some parts of the country, renewable energy is currently not cost competitive with other forms of generating electricity. Moreover, except for biomass energy, renewable energy is dominated primarily by its initial capital costs. As a result, renewables generation development to date has mainly been driven by policy decisions and associated incentives—in the form of state renewable portfolio standards, the federal production

[37] This is in addition to the significant increase in non-hydro renewables cited earlier.

tax credit (PTC), the solar investment tax credit (ITC) and other financial incentives. **The extensions of the PTC and ITC, along with the removal of the ITC's utility exclusion, are vitally important to facilitating the increased deployment of renewable energy.**

Provisions in EISA will also help, but will need to be fully funded during the annual appropriations cycle in order to be effective. While outside the scope of comprehensive climate legislation, such congressional action will be a key part of advancing all zero- and low-emissions resources.

Greater deployment of renewable resources for electricity generation will depend on: the intermittent nature of wind and solar, and the associated lack of electricity storage that can overcome the need for backup fossil fuel generation; the regional variations in resource availability[38]; the high costs of some renewable technologies; and the inadequacy of the current transmission and interconnection systems to accommodate the desired growth in renewables generation. Ultimately, increasing the deployment of renewable energy technologies will hinge on addressing multiple technical, economic and regulatory challenges, mainly relating to battery storage, high capital costs, and important transmission siting, building and integration constraints.

Driven by the PTC, the wind industry has succeeded in reducing its production costs by a remarkable amount. Although wind technology has advanced, the cost improvements have been partially offset by increases in production costs, which have risen steadily since 2001 due to a sustained escalation in materials costs and devaluation of the dollar relative to the euro. In addition, even with improvements, unsubsidized wind electricity production costs are still high due to lower capacity factors, driven by intermittency and added costs for firm backup fossil generation. In some instances wind is cost competitive with traditional fuels. However, other

[38] Two states—California and Washington—accounted for almost 40 percent of all renewable generation in the U.S. in 2006 because of their hydroelectric, wind and geothermal resources. Texas led all states in wind generation.

renewable technologies are currently too costly to achieve a significant degree of market penetration.

Another major challenge is siting transmission to support renewable energy development. Because renewable energy resources are often located in sensitive or scenic environments, such as mountain ranges or coastal waters, siting these facilities is difficult.[39] Transmission siting usually faces local opposition and complex, multi-jurisdictional (*i.e.*, state and federal agencies') approval requirements. Moreover, wind resources are intermittent and are often located far from major urban load centers. To gain significant increases in renewable resources, the power sector is seeking major investment in, and extension of, the grid and ideally extra-high voltage transmission in order to maximize renewables' access to certain markets.

Hydroelectric power generates no GHGs. To the extent that existing hydropower can be maintained or expanded through advances in technology, it could continue to be an important part of a carbon-free energy portfolio. However, meaningful growth of this technology is highly unlikely given the aversion to, and difficulty in siting, large-scale dams.

Key breakthroughs could be very significant in allowing renewables to play a bigger role in the long run. Some examples include: continued improvement and cost declines in battery storage for wind and solar,[40] including compressed air storage for wind; other advancements in solar, including molten salt storage, to continue to bring costs down; biotechnology developments in biofuels, with the prospect of growing a significant amount of net-zero carbon emissions fuel supply on small amounts of land; and developments in hydrokinetic (wave and tidal) energy. None of these is available now, and all require significant RD&D to become part of the long-term solution. Given the nature of the obstacles faced, increased RD&D and

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[39] S. Vajjhala, "Siting Renewable Energy Facilities: A Spatial Analysis of Promises and Pitfalls," Resources for the Future Discussion Paper (July 2006).

[40] Wind turbine improvements that lessen noise and limit bird and bat mortality are also desirable.

regulatory and policy regimes conducive to increased renewable deployment will be critical in facilitating the market penetration of renewables generation at a large scale by reducing their costs and by facilitating their integration into the grid and delivery to customers.

In sum, even with very aggressive assumptions on the technical potential of renewable energy and energy efficiency deployment, the electric utility industry will need to depend on fossil fuel and nuclear forms of generation, particularly to serve baseload demand in the near term.

IV. De-carbonizing Baseload Electric Generation Will Depend On Widespread Commercial Deployment Of ACT With CCS And Substantial Builds Of New Nuclear Plants.

The primary sources of baseload generation in the U.S. are coal, nuclear energy, natural gas and hydroelectric power. As indicated in section I above, they will continue to be the primary sources of baseload generation to at least 2030. Natural gas is a premium fuel that, given supply and price constraints, is considered by some observers to be better suited for intermediate and peaking generation, but it can be, and often is, used for baseload generation in many parts of the country.[41] However, it also has a little more than half of the carbon content of coal (on an energy equivalent basis), and thus has significant CO_2 consequences.

The electric utility industry is beginning the process of building new nuclear power plants and is working on the development and deployment of ACT integrated with CCS. With respect to new nuclear plants, there are nine applications at the Nuclear Regulatory Commission, each representing (on average) a 1,400-MW power plant. Projections are for 3-5 new plants to be

[41] Outside of the power sector, natural gas is used as a feedstock in the chemical, petrochemical and fertilizer industries and for other industrial and commercial purposes, and is the primary source of home heating fuel for much of the country.

ready for commercial operation in the 2016-2018 timeframe.[42] Assuming continued support for nuclear energy from federal and state governments, NEI projects that 45 new nuclear power plants could be in commercial operation by 2030, representing about 60 GW of additional capacity.[43] Similarly, EPRI's revised PRISM projects 64 GW of new nuclear plants technically possible by 2030. To put these estimates into perspective, NEI estimated (based on 2006 data) that the U.S. would need about 51 GW of new nuclear capacity by 2030 just to maintain nuclear energy at its 20 percent share of national electricity supply.[44] However, federal support for nuclear energy must be enhanced, and additional loan and financial guarantees (beyond those authorized by the Energy Policy Act of 2005) must be provided. Disposal of used nuclear fuel must also be addressed. With government support in these key areas, nuclear energy could make a greater contribution to reducing GHGs in the near term.

With respect to ACT,[45] there are only two IGCC plants in the U.S.—with only a few more elsewhere in the world—and both are under 300 MW. As Figure 9 below shows, additional IGCC plants and other advanced combustion systems (such as ultra-supercritical pulverized coal (PC) and circulating fluidized bed) will be commercially available in the 2010-2025 timeframe. Widespread commercial deployment depends on bridging the cost differential

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[42] See, *e.g.*, Nuclear Energy Institute (NEI), "Status and Outlook for New Nuclear Power Plants in the United States" 1,5 (July 2007) (hereinafter referred to as "NEI Paper"); Electric Power Daily (Feb. 22 & Apr. 8, 2008).

[43] NEI Paper, *supra* n. 42, at 6.

[44] *Id.*

[45] Proponents of immediate and strict GHG targets and timetables for the electric utility industry point to title IV (Acid Deposition Control) of the Clean Air Act (CAA), added by the CAA Amendments of 1990 to regulate sulfur dioxide (SO_2) and nitrogen oxides (NO_x) emissions under cap-and-trade programs, as a legislative model for cost-effective emissions reductions. However, unlike the SO_2 and NO_x programs, which had SO_2 scrubbers, low-NO_x burners, selective catalytic reduction (SCR) and non-SCR technologies (as well as low-sulfur coal) available, there is currently no CO_2 scrubber. As many organizations—such as EPRI, the Massachusetts Institute of Technology (MIT) and the Coal Utilization Research Council (CURC)—and policy-makers have recognized, CCS, which must operate in an integrated fashion with ACT, will not likely be commercially available on a widely deployable basis until around 2025.

between ACT and conventional PC systems. The revised EPRI PRISM projects 130 GW of existing plant upgrades technically possible by 2030, with each constituent an improvement in heat rate of between 1-3 percent compared to the efficiency of the existing unit. As indicated above, such technical potential may be limited by real-world constraints—particularly, new source review (NSR) regulations under the CAA. Amending or reforming the NSR program could yield substantial near-term reductions in GHGs from power plants and other large stationary sources. For example, were it not for the disincentives created by NSR, one estimate of the benefits from retrofitting all existing coal-fired power plants with technologies to increase boiler or steam efficiency shows a potential overall efficiency increase of roughly 8 percent, with a corresponding potential CO_2 emissions reduction of 200 million tons annually.

Figure 9: Comparison of Clean Coal and CCS Technology Development Estimates

Note: CCS *commercial deployment* would follow 5-10 years after the RD&D timeline below (2025-2035). Any delays in either technology development or funding will significantly affect the estimated timeline for availability.

Roadmap Authors -Primary Source	RD&D Timeline Clean Coal Technology w/o CCS		RD&D Timeline Clean Coal Technology w/ CCS*		Total Funding Required/Timeframe
	IGCC	Adv. Comb.	IGCC	Adv. Comb.	
CURC-EPRI - Roadmap	2010-2025	2010-2025	2017-2025	2020-2025	$17 B over 18 years
EPRI - Reducing CO_2 Emissions from Coal-Based Power Generation	2012-2020		2017-2022	2020-2022	$17 B over 25 years
MIT - Future of Coal					$8-8.5 B over 10 years plus $5 B over 10 years
EEI Projections	**2012-2025**	**2010-2025**	**2020-2025**	**2020-2025**	**$20 B over 25 years**

* Includes stand-alone CO_2 capture and storage demonstrations as well as integrated demonstration.

The chart in Figure 9 above is a compilation of information and projections from EPRI, MIT and CURC. It also shows that CCS technologies are not expected to be commercially available until 2020-2025. (EPRI estimates that 2025 is likely for commercial availability at today's pace, with 2020 possible with more aggressive funding and more demonstration projects.) The Note in the chart indicates that widespread commercial deployment of CCS would follow 5-10 years after the research, development and demonstration (RD&D) timeline, or 2025-2035, and adds, "**Any delays in either technology development or funding will significantly affect the estimated timeline for availability**" (emphasis in original).

As indicated in EEI's September 21, 2007, written statement to the House Select Committee on Energy Independence and Global Warming—from which the chart above was excerpted—, "**[i]t is important to note that this framework should be considered as a whole rather than as a set of discrete tasks**" (emphasis in original) (p. 7). The EEI statement further notes, "Significant challenges are associated with the individual goals related to efficiency, reliability, CO_2 capture and storage, as well as with **integrating** CO_2 capture processes with gasification- and combustion-based power plant processes" (emphasis added) (*id.*). No utility has successfully captured, compressed, transported and stored CO_2 from a coal-fired power plant to date, and the combined storage from all existing pilot and demonstration facilities worldwide would equal the amount of CO_2 emitted from one 250-MW PC plant annually. Moreover, there are considerable non-technical issues that will need to be addressed, including: federal and state regulatory frameworks; siting and permitting; rights-of-way or eminent domain for pipeline transport; property rights (including mineral rights and water rights); risk issues, insurance, and long-term ownership and control post-closure for storage facilities; and public acceptance.

The 2025 timeframe for the commercial availability of ACT integrated with CCS has been noted by several policy-makers.[46] Labor officials such as AFL-CIO Industrial Union Council executive director Robert Bauch have also noted the timing issue:

> We're worried about the ability to move carbon capture and sequestration. It's a riddle the world has to solve. It could become the source of many new jobs, but we're worried about the **timing.**"[47]

In addition, note the large amount of additional government and private sector funding—about **$800 million to $1 billion annually for the next 25 years**—that will be necessary for RD&D of ACT and CCS.[48]

In sum, RD&D of ACT and CCS, coupled with widespread commercial deployment of new nuclear plants and ACT and CCS, would buy time for the development of the next generation of electric generation and transportation technologies. Such RD&D and deployment also would be far preferable to massive fuel switching from coal to natural gas in a carbon-constrained environment in the near term (a topic addressed in section VI below), and would be consistent with long-term goals. The importance of developing these technologies is also critical from an international perspective, given the heavy dependence of many large developing countries, such as China and India, on coal as their primary source of electricity.

V. Plug-In Hybrid Electric Vehicles And Electrification Of Transportation Can Reduce GHG Emissions.

Transport emissions are the second largest source of U.S. GHG emissions, so it is important that ways be found to reduce their contribution. One promising technology is the

[46] See, *e.g.*, "No Deep Emission Cuts by Utilities Till 2025," Energy Daily (March 12, 2008); "Key House Democrat Ties Major CO2 Cuts For Coal To Storage Availability," Clean Air Report (March 20, 2008).
[47] "Green Around the Collar," Congressional Quarterly Weekly (March 30, 2008) (emphasis added).
[48] This $800 million-$1 billion annual figure does not include the costs of widespread commercialization of technologies, which is expected to be borne by the private sector.

development of PHEVs. In 2007 EPRI and the Natural Resources Defense Council (NRDC) released a comprehensive analysis of the potential GHG reductions in the U.S. from wide-scale introduction of PHEVs.[49] The research measures the impact of increasing numbers of PHEVs between 2010 and 2050, including potentially large fleets that would use electricity from the grid as their primary fuel source. Among the study's findings were:

- Widespread adoption of PHEVs can reduce GHG emissions from vehicles by more than 450 million tons annually in 2050.
- There is an abundant supply of electricity for transportation; a 60-percent U.S. market share for PHEVs would use 7-8 percent of grid-supplied electricity in 2050.
- PHEVs can improve nationwide air quality and reduce petroleum consumption by 3-4 million barrels per day in 2050.

In its PRISM analysis, EPRI assumes that PHEVs can comprise 10 percent of new light-duty vehicle sales by 2017 and 33 percent by 2030.

EISA contained a number of provisions to support PHEV development, including: funding PHEV manufacturing, battery research, PHEV conversion, electricity storage research, PHEV demonstration and near-term deployment and market assessment programs, and studies of integration with electric infrastructure and smart grid as well as how to maximize off-peak electricity use for PHEV charging and on-peak use of PHEV-stored electricity by the grid. PHEVs also qualify for various benefits given to other renewable transportation fuels. Full appropriations for EISA's PHEV provisions, including tax credits, will be necessary for continued orderly development of this technology.

Additional GHG emissions benefits can be realized through electrification of the transportation infrastructure. This can be implemented through electrification of truck stops,

[49] EPRI and NRDC, Environmental Assessment of Plug-In Hybrid Electric Vehicles, Palo Alto, CA (July 2007).

ports and airports, thereby avoiding the GHGs that would otherwise be emitted from idling trucks, ships and planes.

In sum, it is important that any climate legislation include provisions speeding up commercialization of PHEVs—including battery research and vehicle demonstration, deployment and commercialization—and providing for electrification of transport.

VI. **Massive Fuel Switching From Coal To Natural Gas Would Have Serious Effects On The Economy.**

In the electric utility sector, the principal concerns with strict and immediate GHG targets in the near term are the costs and economic distortions that would result from massive fuel switching from coal to natural gas. This would cause large price increases and supply constraints in the power sector,[50] as well as high prices and constrained supply in residential heating and feedstock industries such as chemical, petrochemical and fertilizer manufacturers. Many of these industries would likely either shut down or move overseas. Other industrial and commercial firms that rely on natural gas for fuel also would be substantially affected. Liquefied natural gas (LNG) imports are projected to increase, but they are more than offset by the combination of greater natural gas exports to Mexico and declining imports from Canada.[51] Moreover, LNG imports face siting challenges and geopolitical instability in developing countries that control supply.[52] On fuel switching generally, see Government Accountability Office, "Implications of Switching from Coal to Natural Gas" 5-6, 11-19 (May 1, 2008).

There ordinarily is considerable volatility in natural gas prices and markets, and massive fuel switching from coal to natural gas would exacerbate both prices and volatility. As an

[50] Gas supply contracts in the power sector are typically set for long periods of time.
[51] G. Caruso, EIA "Annual Energy Outlook 2008," D.C. Chapter of American Association of Blacks in Energy (Apr. 28, 2008).
[52] Major weather events, such as a hurricane, could also produce high swings in electricity and natural gas prices as well as the price of CO_2 allowances.

example of the impact of major fuel switching from coal to natural gas, the additional natural gas price increases (beyond the reference case) under S. 2191 have been noted in several economic studies as follows:

- Nicholas Institute: 18 percent by 2020, 21 percent by 2030.
- MIT: 39 percent by 2020, 64 percent by 2030.

In addition to the economic dislocations outlined above, there are two other principal effects of massive fuel switching from coal to natural gas. The first is **destruction of electricity demand**—which, we submit, would 1) compel consumers to use less electricity and 2) be harmful to a healthy and growing economy. The second is the **diversion of investment capital from advanced climate technologies**—such as nuclear power plants and ACT and CCS—to building natural gas plants in order to reduce GHGs and meet rising baseload demand in the near term. Thus, at precisely the time that the power sector should be devoting critical investment to the development and commercial deployment of new nuclear plants and ACT and CCS (2010-2030), it could be channeling investment capital to natural gas in order to comply with stringent climate change legislation.